

Oral Presentation Abstracts

1 **Elucidating Metal Sorption Mechanisms at the Mineral/Water Interface: From the Macroscopic to the Molecular Scale**

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A fundamental understanding of the kinetics and mechanisms of metal sorption in natural systems is important in assessing the speciation, mobility, and bioavailability of metals in soil and water environments. To definitively describe the reaction mechanisms, it is preferable to employ both macroscopic and molecular scale approaches. In this paper, recent advances will be discussed in elucidating the dynamics and mechanisms of metal adsorption and precipitate transformations on soil minerals and soils and in directly ascertaining metal speciation in contaminated soils. It will be shown that with metals such as Ni and Zn, metal hydroxide precipitates form on an array of mineral surfaces that are common in the natural environment and in laboratory- and field-contaminated soils. The precipitates often occur on time scales of minutes, at metal surface loadings far below a theoretical monolayer coverage, and in a pH range well below that at which metal hydroxide precipitates would be expected to form according to the thermodynamic solubility product. Dissolution studies indicate that the formation of these precipitates greatly enhances the sequestration of the metal. Using in-situ XAFS and DRS, coupled with HRTGA, the enhanced stability was ascribed to the stepwise transformation of an initial metal-hydroxide precipitate to a precursor metal phyllosilicate phase. The inclusion of both adsorbed and precipitated phases must be included in sorption models to accurately predict the fate of metals in the environment.